ACADEMY OF HEALTH SCIENCES *M MTN9-J2F
DEPARTMENT OF MEDICAL SCIENCE 0900
PHYSICAL THERAPY BRANCH

Anatomy and Kinesiology of the Forearm and Hand

REFERENCES:

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Brand PW & Hollister A: Clinical Mechanics of the Hand, 2nd Ed., Mosby, 1993.

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Netter FH: Atlas of Human Anatomy. CIBA-Geigy Corp., New Jersey, 1989.

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Tortora GJ & Grabowski SR: Principles of Anatomy and Physiology, 7th Ed. , Harper Collins College Publishers, NY, 1993.

OBJECTIVES:

1. Terminal Learning Objective: Given a simulated patient, specify the origin, insertion, inneravtion and action of the muscles of the forearm and hand IAW cited references.

2. Enabling Learning Objectives:

   a. Discuss the articulations of the elbow, forearm, wrist and hand IAW references.

   b. Discuss the muscles acting on the elbow, forearm, wrist and hand IAW references.

   c. Discuss the contents of the Carpal Tunnel, Guyan's Canal and the Cubital Tunnel IAW references.

   d. Discuss the extensor retinaculum at the wrist & the volar plates of the fingers IAW references.

NOTES

A. General Structure of the Upper Extremity.

1. Bones:

   a. Arm - humerus

   b. Forearm - radius and ulna

   c. Wrist - eight carpal bones

      Pisiform, Triquetrum, Lunate, Scaphoid, Hamate, Capitate, Trapezoid, Trapezium.

   d. Hand - five metacarpals & fourteen phalanges.

2. Muscles - General Rules:

   a. Anterior Arm:

      1) Flexors

      2) Innervated by the Musculocutaneous Nerve.

   b. Posterior Arm:

      1) Extensors

      2) Innervated by the Radial Nerve.

   c. Anterior Forearm:

      1) Generally flexors and pronators

      2) Generally originate at the Medial Epicondyle of the Humerus except the deep muscles.

      3) Generally innervated by the **Median** Nerve.
         *Exceptions are 1& ½ muscles which are innervated by the **Ulnar** nerve.

NOTE: Flexor Carpi Ulnaris and Flexor Digitorum Profundus to digits four and five are Ulnar nerve Innervated.

      4) Has a superficial and deep layer of muscles.

d. Posterior Forearm:

1) Generally Extensors and supinators

2) Generally originate at the Lateral Epicondyle of the Humerus except the deep muscles.

3) **All** are innervated by the **Radial** Nerve.

4) Has a superficial and deep layer of muscles.

e. Hand Muscles:

1) Those that originate within the area of the hand are **Intrinsics**.

2) Those that originate outside of the hand (such as the elbow) are **Extrinsics**.

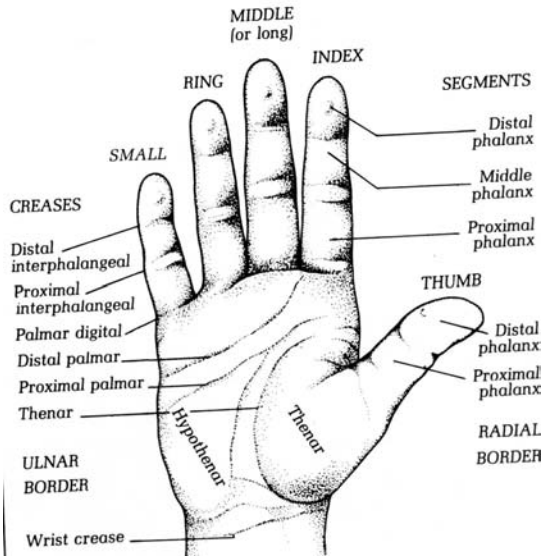
3) Power comes form the extrinsics, fine control and tight fists come from the intrinsics.

4) All but one intrinsic muscle lie on the palmar side of the hand.

5) Intrinsics are generally innervated by the Ulnar nerve except those acting on the thumb which are primarily Median nerve innervated.
*exceptions are the first and second lumbrical (Median), Adductor Pollicis (half Ulnar)and the Flexor Pollicis Brevis (partial Ulnar).

f. Interchangeable terms

- Lateral side = radial side
- Medial side = ulnar side
- 1st digit = Thumb (T)
- 2nd digit = Index finger (IF)
- 3rd digit = Middle finger (MF)
- 4th digit = Ring finger (RF)
- 5th digit = Small finger (SF)



3. Sensory Innervation:

a. Nerve Root Levels - **Dermatomes**

Note: The dermatomes vary from person to person and the textbooks vary equally as much.

1) C5 - Lateral aspect of arm.

2) C6 - Lateral aspect of the forearm and the first and second digit.

3) C7 - Third digit and middle of palm.

4) C8 - Medial aspect of forearm and the forth and fifth digit.

5) T1 - Medial aspect of arm.

b. Peripheral Innervation - Nerve Fields:

1) **Radial Nerve** - Posterior arm (inferior half) and forearm, posterior (dorsum) of lateral hand extending into digits one, two, three and the lateral half of four distally to the Distal Interphalangeal Joint (DIP).

2) **Median Nerve** - Anterior (palmar) lateral hand extending into digits one, two, three and the lateral half of four to include the posterior of these digits distally from the DIP joint.

3) **Ulnar Nerve** - Medial hand (posterior and anterior) extending into digits five and the medial half of four.

4) **Lateral Antebrachial Cutaneous Nerve** - Lateral forearm.

NOTE: The Musculocutaneous Nerve branches into the Lateral Antebrachial Cutaneous nerve which provides this sensory innervation.

5) **Medial Antebrachial Cutaneous Nerve** - Medial forearm.

B. Muscles of the Anterior Aspect of the Arm

1. **Biceps Brachii**

a. Origin:

1) Long head - supraglenoid tubercle of the scapula.

2) Short head - coracoid process of the scapula.

b. Insertion - radial tuberosity of the radius.

c. Innervation - Musculocutaneous nerve

d. Actions: (3)

1) Shoulder flexion

2) Elbow flexion - strongest when the forearm is supinated.

3) Supination of elbow and wrist.

2. **Brachialis**

a. Origin - anterior surface of the inferior half of the humerus (large area).

b. Insertion - ulnar tuberosity of the ulna.

c. Innervation - Musculocutaneous nerve.

d. Action - elbow flexion.

e. Power house of the elbow flexors - always active in elbow flexion movements while the other flexor muscles may not be; strongest flexor of the elbow when the forearm is pronated.

C. Muscles of the Posterior Aspect of the Arm

1. **Triceps Brachii**

a. Origin:

1) Long head - Infraglenoid tubercle of the scapula.

2) Lateral head - Superior lateral portion of the posterior humerus (small area).

3) Medial head - Inferior two thirds of medial posterior humerus and inferior lateral portion of the posterior humerus (large area).

b. Insertion - Olecranon process.

c. Innervation - Radial nerve.

d. Actions:

1) Elbow extension (Primary motion).

2) Shoulder extension.

3) Shoulder adduction.

2. **Anconeus**

a. Origin - Posterior of lateral epicondyle of the humerus.

b. Insertion - Lateral posterior surface of ulna - just inferior to the olecranon.

c. Innervation - Radial nerve.

d. Action - Elbow extension - believed to be more of a joint stabilizer than a joint mover.

D. The Elbow Joint

1. **Ulnotrochlear articulation**

a. Synovial hinge: uniaxial - flexion/extension.

b. Trochlear notch of ulna & the trochlea of the humerus.

2. **Radiocapitular articulation**

a. Synovial planar: uniaxial (because of association with the ulnotrochlear joint) - flexion/extension.

b. Radial head & Capitulum of the humerus.

3. **Proximal Radiounlar articulation**

a. Synovial pivot: uniaxial - rotation (supination/pronation).

b. Radial head & the radial notch of the ulna.

c. Ligament: **annular ligament** - holds head of radius to ulna. This ligament attaches to the ulna at both ends making a loop which encircles the radial head. It does not attach to radial head.

d. Motion of supination/pronation is obtained by the radius moving superiorly over the ulnar medially for pronation and laterally for supination.

NOTE: Clinical comment: Nursemaids elbow is a clinical condition of young children. The child's forearm is yanked causing the radial head to slip out of the annular ligament. Painful - elbow stuck in partial flexion - but easily reduced.

E. Muscles of the Anterior Forearm

1. Superficial Layer (5 muscles)

NOTE: Surface anatomy: Place the contralateral palm on the medial epicondyle and the location of the five fingers approximates the location of the five superficial anterior muscles.

a. **Pronator Teres** (Latin: teres = sausage shaped)

1) Origin:

a) Humeral head - superior portion of medial epicondyle.

b) Ulnar head - coronoid process of the ulna.

2) Insertion - anterior lateral portion of the midshaft of the radius.

3) Innervation - Median nerve.

4) Action - Pronation - pulls the radius over the ulna.

b. **Flexor Carpi Radialis**

1) Origin - common flexor tendon - medial epicondyle.

2) Insertion - base of 2^{nd} & 3^{rd} metacarpals.

3) Innervation - Median nerve.

4) Action:

a) Flexion of the wrist.

b) Radial deviation of the wrist.

c. Palmaris Longus

1) Origin - Common flexor tendon - medial epicondyle.

2) Insertion - deep palmar skin (NO BONEY INSERTION).

3) Innervation - Median nerve.

4) Action - weak wrist flexor.

5) Clinically significant as a tendon used in tendon transfers when another anterior forearm muscle is injured beyond repair.

6) 14-30% of the population is lacking one or both Palmaris Longus muscle(s).

d. Flexor Carpi Ulnaris

1) Origin - common flexor tendon - medial epicondyle.

2) Insertion:

a) Base of the 5th metacarpal.

b) Pisiform

c) Hamate

3) Innervation - Ulnar nerve ***exception to general rule.

4) Actions:

a) Flexion of the wrist.

b) Ulnar deviation of the wrist.

e. Flexor Digitorum Superficialis

NOTE: Slightly deeper to the first four muscles.

1) Origin:

a) Humeroulnar head - common flexor tendon - medial epicondyle, and proximal anterior ulna.

b) Radial head - anterior middle radius.

2) Insertion - sides of the middle phalanges of digits 2 - 5. The tendon for each digit splits into two around the proximal interphalangeal joint (PIP) and they insert on to either side of the middle phalanx.

3) Innervation - Median nerve.

4) Action - Flexion of the PIP joint for digits 2 - 5.

NOTE: This muscle, as others in the anterior forearm, also can cause flexion of the wrist but it is not a prime mover of the wrist.

2. Deep Layer (3 muscles)

a. Flexor Digitorum Profundus

1) Origin - upper 3/4th of ulna & interosseous membrance.

2) Insertion - base of the distal phalanges of digits 2-5.

3) Innervation:

a) Median nerve - to digits 2 & 3.

b) Ulnar nerve - to digits 4 & 5. *** exception to the general rule.

4) Action - flexion of the DIP joints of the digits 2 - 5.

NOTE: Will also produce flexion of the PIP joints and wrist.

b. **Flexor Pollicis Longus**

1) Origin - Anterior middle portion of radius & interosseous membrane.

2) Insertion - base of distal phalanx of the first digit.

3) Innervation - Median nerve.

4) Action - flexion of the interphalangeal joint (IP) of the first digit.

c. **Pronator Quadratus**

1) Origin - medial lower 4th of the ulna.

2) Insertion - lateral lower 4th of the radius.

3) Innervation - Median nerve.

4) Action - Pronation - pulls the radius over the ulna.

3. Gliding Mechanism for Extrinsic Finger Flexors

a. Retinaculum: fibrous connective tissue, holds tendons & nerves in place

b. Ligaments/ pulleys; annular and cruciform ligaments, guide tendons, prevents bowstringing

c. Bursae/ tendon sheaths: lubrication, nutrition

F. Muscles of the Posterior Forearm

1. Superficial Layer (6 muscles)

a. **Brachioradialis**

1) Origin - lateral humerus superior to the lateral epicondyle.

2) Insertion - styloid process of the radius.

3) Innervation - Radial nerve.

4) Action - elbow flexion - strongest when the forearm is in neutral.

b. **Extensor Carpi Radialis Longus**

1) Origin - superior to the lateral epicondyle but inferior to the brachioradialis muscle origin.

2) Insertion - base of the 2nd metacarpal.

3) Innervation - Radial nerve.

4) Actions:

a) Extension of the wrist.

b) Radial deviation of the wrist.

b. **Extensor Carpi Radialis Brevis**

1) Origin - common extensor tendon - lateral epicondyle.

2) Insertion - base of the 3rd metacarpal.

3) innervation - Radial nerve.

4) Actions:

a) Extension of the wrist.

b) Radial deviation of the wrist.

d. **Extensor Digitorum**

1) Origin - common extensor tendon - lateral epicondyle.

2) Insertion - bases of the middle and distal phalanges of digits 2 - 5.

3) Innervation - Radial nerve.

4) Action - Extension of the digits 2 - 5.

e. **Extensor Digiti Minimi**

1) Origin - common extensor tendon - lateral epicondyle - off the Extensor Digitorum Communis.

2) Insertion - base of the middle and distal phalanx of the 5th digit.

3) Innervation - Radial nerve.

4) Action - extension of the 5th digit.

f. Extensor Carpi Ulnaris

1) Origin - common extensor tendon - lateral epicondyle.

2) Insertion - base of the 5th metacarpal.

3) Innervation - Radial nerve.

4) Actions:

a) Extension of the wrist.

b) Ulnar deviation of the wrist.

2. Deep Layer (5 muscles)

a. Abductor Pollicis Longus

1) Origin:

a) Mid-shaft ulna.

b) Mid-shaft radius.

c) Interosseous membrane.

2) Insertion - lateral side of the base of the 1st metacarpal.

3) Innervation - Radial nerve.

4) Action - palmar abduction of the first digit.

NOTE: First digit abduction is performed palmarly - **away from the palm** (at a right angel to the palm)

b. Extensor Pollicis Brevis

1) Origin - inferior shaft of radius and interosseous membrane.

2) Insertion - posterior base of the proximal phalanx of the 1st digit.

3) Innervation - Radial nerve.

4) Action - Extension of the metacarpophalangeal (MP) joint of the 1st digit

.

NOTE: Extension and flexion of the thumb occurs in a **plane parallel with the fingers.** Flexion crosses all the way across the palm.

5) The tendon of the Extensor Pollicis Brevis and the Abductor Pollicis Longus run together as they cross the wrist. This is a frequent site of tendinitis called De Quervain's Disease.

c. Extensor Pollicis Longus

1) Origin - mid-shaft of the ulna, distal to the Abductor Pollicis Longus origin.

2) Insertions - posterior base of the distal phalanx of the 1st digit.

3) Innervation - Radial nerve.

4) Action - extension of the IP joint of the 1st digit.

5) Anatomical Snuff Box - region of wrist bordered by the tendon of the Extensor Pollicis Longus and the Abductor Pollicis Longus & Extensor Pollicis Brevis. The "floor" of the snuff box are the scaphoid and trapezium bones. Increased tenderness at the snuff box after a fall onto an outstretched hand (FOOSH) is indicative of a scaphoid fracture.

d. **Extensor Indicis**

1) Origin - inferior ulnar shaft (inferior to Extensor Pollicis Longus' origin) & interosseous membrane.

2) Insertion - middle and distal phalanges of the 2nd digit.

3) Innervation - Radial nerve.

4) Action - extension of the 2nd digit.

e. **Supinator**

1) Origin:

a) Lateral epicondyle of humerus.

b) Lateral proximal ulna.

2) Insertion - lateral and anterior proximal radius.

3) Innervation - Radial nerve.

4) Action - supination - pulls the radius over the ulna laterally.

3. Dorsal Compartment at the Wrist
6 compartments formed by the extensor retinaculum at the dorsal wrist that holds the extensor tendons in place and directs forces of pull of the muscle. Each compartment has specific tendons contained within it.

1st: EPB & APL
2nd: ECRL & ECRB
3rd: EPL
4th: EDC & EI
5th: EDM
6th: ECU

G. Joints of the Forearm, Wrist & Hand

1. **Intermediate Radiounlar Joint**

a. Fibrous - no motion

b. Interosseous membrane - transfers force from the radius to the ulna when weight bearing through the wrist.

2. **Distal Radioulnar Joint (DRUJ)**

Synovial - supination/pronation.

a. Ulnar notch of the radius & the ulnar head.

b. Ligament - **Articular disc** (fibrocartilaginous disc). Unites radius and ulna while still allowing rotation movement. Also separates the ulna from the carpal bones. Known as the triangular fibrocartilagenous complex or TFCC.

3. **Radiocarpal Joint** (Wrist)

a. Synovial Condyloid: biaxial - flexion/extension & ulnar/radial deviation.

b. Articular surface of radius & articular disc and the scaphoid, lunate & triquetrum carpal bones. No Ulna involvement!

c. Ligaments:

1) Ulnar and Radial Collateral Ligaments.

2) Dorsal and Palmar Radiocarpal Ligaments.

3) Dorsal and Palmar Ulnocarpal Ligaments.

4) Transverse Carpal Ligament (Flexor Retinaculum) - The “roof” of the carpal tunnel, retains the finger and thumb flexor tendons and the median nerve at the wrist. The site of carpal tunnel syndrome. Contents are:

- FDS, FDP, FPL, Median N

3. **Intercarpal Joint**

   a. Synovial

   b. Proximal row of carpal bones and the distal row of carpal bones.

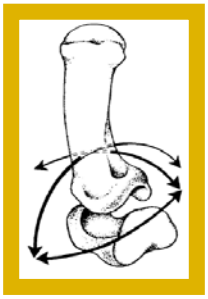
4. **Carpometacarpal Joint (CMC) for <u>digits 2 - 5</u>**

   a. Synovial

   b. Distal row of carpal bones and bases of 2 - 5 metacarpals.

   <u>NOTE:</u> Meta = beyond

5. **Carpometacarpal Joint (CMC) for <u>digit 1</u>**



   a. Synovial saddle: biaxial - flexion/extension & abduction/adduction.

   b. Trapezium and the 1st metacarpal.

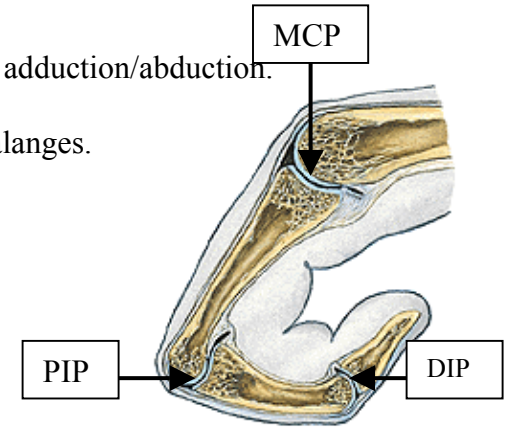
   c. Opposition - combined flexion and abduction at the CMC joint allows the 1st digit palmarly to touch the palmar tip of the other digits.

6. **Metacarpophalangeal (MP) Joints**

   a. Synovial condyloid: biaxial - flexion/extension & adduction/abduction.

   b. Metacarpal heads and the base of the proximal phalanges.

7. **Interphalangeal (IP) Joints**



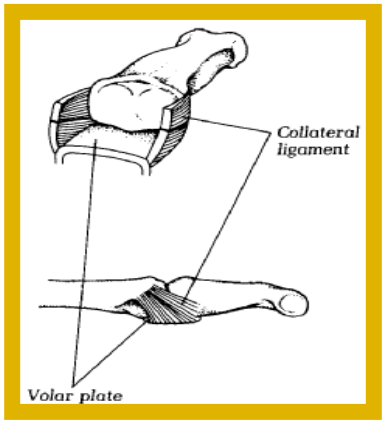
   a. Synovial hinge: uniaxial - flexion/extension.

   b. Head of phalanx with base of the distal phalanx.

   c. Digits 2 - 5 have a distal (DIP) and proximal (PIP) interphalangeal joint. Digit 1 has only one IP joint.

8. **Ligaments of the Fingers**

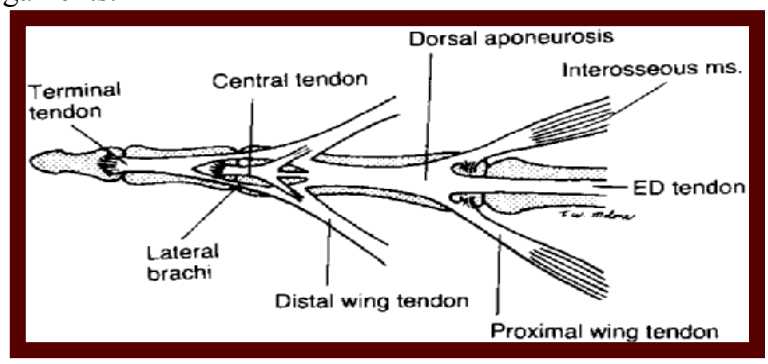
a. Palmar ligaments = **Volar plates**: fibrocartilagenous plates reinforcing the MCP and IP joints anteriorly (palmar side).



b. Collateral ligaments: strong bands on the radial and ulnar sides of the joints.

c. Extensor Hood Mechanism: expansion of the extensor tendons over the dorsal digits from the MCP to the DIP that allow the fingers to fully extend.

1. An extensive network of bands, aponeurosis and retinacular ligaments.



2. Also serves as a site for muscle attachments of the lumbricals and interossei.

3. Disruption of any part of the extensor hood mechanism will lead to deformities

H. Muscles of the Hand

1. The Thenar Eminence - the muscles on the palmar lateral side of the hand that produce actions of the first digit.

   a. **Abductor Pollicis Brevis**

      1) Origin - transverse carpal ligament.

      2) Insertions - lateral side of the base of proximal phalanx of the 1st digit.

      3) Innervation - Median nerve.

      4) Action - adbuct the 1st digit at the MP joint.

   b. **Opponens Pollicis**

      1) Origin - transverse carpal ligament.

      2) Insertion - 1st metacarpal shaft.

      3) Innervation - Median nerve.

      4) Action - Opposition at the CMC joint.

   c. **Flexor Pollicis Brevis**

      1) Origin - transverse carpal ligament.

      2) Insertion - anterior-lateral base of proximal phalanx of the 1st digit.

      3) Innervation:

         a) Median nerve.
         b) Ulnar nerve (to deep head of muscle). ***exception to the general rule

      4) Action - flexion of the 1st digit at the MP joint.

d. **Adductor Pollicis**

1) Origin - base and shaft of the second and third metacarpal.

2) Insertion - medial side of the base of the proximal phalanx of the 1st digit.

3) Innervation - Ulnar nerve. ***exception to the general rule.

4) Action - adduction of the 1st digit.

2. Hypothenar Eminence - the muscles on the palmar medial side of the hand that produce actions of the fifth digit.

a. **Abductor Digiti Minimi**

1) Origin - pisiform.

2) Insertion - medial base of the 5th proximal phalanx.

3) Innervation - Ulnar nerve.

4) Action - abduction of the 5th digit at the MP joint.

b. **Opponens Digiti Minimi**

1) Origin - transverse carpal ligament.

2) Insertion - shaft of the 5th metacarpal.

3) Innervation - Ulnar nerve.

4) Action - Opposition of the 5th digit.

c. **Flexor Digiti Minimi**

1) Origin - transverse carpal ligament.

2) Insertion - base of the 5th proximal phalanx.

3) Innervation - Ulnar nerve.

4) Action - flexion of the 5th digit at the MP joint.

3. Central Hand Muscles

a. **Lumbricals** (Latin: lumbricals = worm-like)

1) Origin - radial side of the four tendons of the Flexor Digitorum Profundus muscle.
No bony origin.

2) Insertion - the four tendons of the Extensor Digitorum Communis muscle. No bony insertion.

3) Innervation

a) Median nerve to digits 2 & 3. ***exception to the general rule.

b) Ulnar nerve to digits 4 & 5.

4) Actions:

a) Flexion of the MP joints of digits 2 - 5.

b) Extension of the PIP and DIP joints of digits 2 - 5.

5) The muscle passes by the MP joints on the lateral side of the joint.

b. **Palmar Interossei** (3 muscles)

1) Origin - side of the metacarpals of digits 2, 4 & 5.

a) 2nd metacarpal - medial (ulnar) side.

b) 4th & 5th metacarpal - lateral (radial) side.

2) Insertion - extensor mechanism of digits 2, 4 & 5 and the base of the proximal phalanges of digits 2, 4 & 5.

a) 2nd digit -medial (ulnar) side.

b) 4th & 5th digit - lateral (radial) side.

3) Innervation - Ulnar nerve.

4) Action - Adduction (moving toward the 3rd digit)

of the MP joints of digits 2, 4 and 5.

NOTE: The 1st digit has an individual muscle to do this action (Adductor Pollicis Brevis) and the 3rd digit does not adduct.

c. **Dorsal Interossei** (4 muscles)

1) Origin - the sides of the adjacent metacarpals

a) Metacarpals 1 & 2.

b) Metacarpals 2 & 3.

c) Metacarpals 3 & 4.

d) Metacarpals 4 & 5.

2) Insertion - lateral (radial) side of the bases of the 2nd & 3rd proximal phalanges and the medial (ulnar) side of the bases of the 3rd and 4th proximal phalanges.

3) Innervation - Ulnar nerve.

4) Action - Abduction (away from the 3rd digit) of the MP joints of digits 2, 3 & 4.

NOTE: The 1st and 5th digit have individual muscles to produce this motion (Abductor Pollicis Brevis and the Abductor Digiti Minimi) and the third digit abducts in both directions.

d. **Palmaris Brevis**

1) Origin - medial (ulnar) border of the palmar aponeurosis (deep fascia). No bony origin.

2) Insertion - the skin of the medial (ulnar) border of the palm. No bony insertion.

3) Innervation - Ulnar nerve

4) Action - tightens the skin of the hypothenar eminence.

PB →

Worksheets for the Forearm and Hand Classes

Muscle Actions

Place an "X" under the correct motion(s) of each muscle listed. For the motion of the digit section also indicate which joint is moving - MP joint, CMC joint PIP or DIP joint.

Muscles **Shoulder Motions**:

	FLEX.	EXT.	ABD.	ADD.	IR	ER
1. Biceps Brachii						
2. Triceps Brachii						

Elbow Motions:

	FLEX	EXT
1. Biceps Brachii		
2. Triceps Brachii		
3. Brachialis		
4. Anconeus		

Wrist Motions:

	FLEX	EXT	RAD DEV	ULN DEV
1. Ext. Carpi Ulnaris				
2. Ext. Carpi Radialis Long.				
3. Ext. Carpi Radialis Brev.				
4. Flex. Carpi Ulnaris				
5. Flex. Carpi Radialis				
6. Palmaris Longus				

Combined Wrist and Elbow Motions:

Pronation Supination

1. Biceps Brachii
2. Pronator Teres
3. Pronator Quadratus
4. Supinator

First Digit Motions:

FLEX EXT ABD ADD OPP what joint in digit

1. Flexor Pollicis Longus
2. Flexor Pollicis Brevis
3. Ext. Pollicis Longus
4. Ext. Pollicis Brevis
5. Opponens Pollicus
6. Abd. Pollicis Longus
7. Abd Pollicis Brevis
8. Add. Pollicis

2-5 Digit Motions:

FLEX EXT ABD ADD OPP what joint in digit

1. Flexor Dig. Superf.
2. Flexor Dig. Profun.
3. Ext. Dig Communis
4. Lumbricals
5. Palmar Interossei
6. Dorsal Interossei
7. Ext. Indicis
8. Ext. Dig. Minimi
9. Flex. Dig. Minimi
10. Abd. Dig Minimi
11. Opp. Dig. Minimi

Other Motions (write out action)

1. Palmaris Brevis

Innervations

List the muscle under the nerve that innervates it.

Muscles:

1. Biceps Brachii
2. Lumbricals
3. Triceps Brachii
4. Brachioradialis
5. Pronator Teres
6. Flexor Carpi Radialis
7. Extensor Pollicis Longus
8. Flexor Carpi Ulnaris
9. Flexor Digiti Minimi
10. Abductor Pollicis Brevis
11. Flexor Pollicis Longus
12. Pronator Quadratus
13. Anconeus
14. Extensor Carpi Radialis Longus
15. Palmaris Brevis
16. Extensor Digitorum Communis
17. Extensor Digiti Minimi
18. Abductor Digiti Minimi
19. Abductor Pollicis Longus
20. Opponens Pollicis
21. Palmaris Longus
22. Extensor Indicis
23. Supinator
24. Flexor Digitorum Profundus
25. Extensor Pollicis Brevis
26. Flexor Pollicis Brevis
27. Adductor Pollicis
28. Extensor Carpi Ulnaris
29. Opponens Digiti Minimi
30. Flexor Digitorum Superficialis
31. Brachialis
32. Palmar Interossei
33. Dorsal Interossei
34. Extensor Carpi Radialis Brevis

NERVES: List the muscles innervated by these nerves.

Median	Ulnar	Radial	Musculocutaneous